

Permit Number

Checked By/Date

## Envelope Compliance Certificate 2000 IECC

COMcheck-EZ Software Version 2.5 Release 1

Data filename: C:\Program Files\Check\COMcheck-EZ\25r1\example.cck

### Section 1: Project Information

Project Name: COMcheck-EZ Example Building  
10, Any Street., Bozeman, MT  
Designer/Contractor: Eric Makela  
P.O.Box 123, Bozeman, MT  
Document Author: Eric Makela  
P.O.Box 123, Bozeman, MT  
Notes: This example data file demonstrates compliance to  
2000 IECC

**Step One:** Verify that the project information matches the information on the building plans. The city, state, code year and construction type will impact energy code compliance.

### Section 2: General Information

Building Location (for weather data): Bozeman, Montana  
Climate Zone: 15  
Heating Degree Days (base 65 degrees F): 7836  
Cooling Degree Days (base 65 degrees F): 283  
Project Type: New Construction

**Step Two:** Verify that the Building Type and Floor Area match the project type. Verify that the Floor Area does not exceed the project floor area shown on the building plans.

#### Activity Type(s)

Office  
Convention, Conference or Meeting Center  
Corridor, Restroom, Support Area  
Storage, Industrial and Commercial  
Industrial Work, < 20 ft Ceiling Height  
Lobby - Other

#### Floor Area

4520  
420  
1400  
2520  
2700  
600

### Section 3: Requirements Checklist

Bldg. |  
Dept. |  
Use |

#### Air Leakage, Component Certification, and Vapor Retarder Requirements

- |     |  |    |   |
|-----|--|----|---|
| [ ] |  | 1. | All joints and penetrations are caulked, gasketed, weather-stripped, or otherwise sealed. |
| [ ] |  | 2. | Windows, doors, and skylights certified as meeting leakage requirements.                  |
| [ ] |  | 3. | Component R-values & U-factors labeled as certified.                                      |
| [ ] |  | 4. | Vapor retarder installed.   |

**Step Three:** Verify that construction assemblies listed under Component Name/Description match the construction assemblies shown on the plans.

**Step Four:** Verify that the Gross Area or Perimeter values represent the proposed house. Verify window area is correct by using rough opening as shown on the plans.

**Step Five:** Verify that the insulation R-values shown on the building plans meet or exceed the values in the Cavity R-value section. Verify that the insulation will fit uncompressed in the framing cavity. Continuous R-values are for insulation installed over the face of framing.

**Step Six:** Verify the window and door U-factors shown on the building plans meet or exceed what is shown in the documentation.

#### Climate-Specific Requirements

##### Component Name/Description

Roof 1: Non-Wood Joist/Rafter/Truss  
 Skylight 1: Metal Frame, Double Pane, Tinted, SHGC 0.80  
 Exterior Wall 1: Solid Concrete or Masonry <= 8"  
     Furring: Metal  
 Door 1: Glass, Clear, SHGC 0.58  
 Window 1: Metal Frame, Double Pane with Low-E  
     Tinted, SHGC 0.63  
 Window 2: Metal Frame, Double Pane, Clear, SHGC 0.72  
 Door 2: Overhead  
 Door 3: Solid  
 Interior Wall 2: Metal Frame, 16" o.c.  
 Basement Wall 1: Solid Concrete or Masonry <= 8"  
     Furring: None, Wall Ht 12.5, Depth B.G. 7.0  
 Floor 1: Unheated Slab-On-Grade, Vertical 2 ft.

Gross Area	Cavity R-Value	Cont. R-Value	Proposed U-Factor	Budget U-Factor
6112	0.0	26.1	0.037	0.050
112	---	---	0.500	0.050
6000	22.0	0.0	0.114	0.072
42	---	---	0.700	0.520
1500	---	---	0.600	0.520
56	---	---	0.700	0.520
288	---	---	0.140	0.118
40	---	---	0.200	0.118
812	22.0	0.0	0.106	0.118
2000	---	10.8	0.082	0.096
160	---	10.8	---	---

(a) Budget U-factors are used for software baseline calculations ONLY, and are not code requirements.

**Envelope PASSES:** Design 6% better than code

**Step Seven:** Verify that the Building Envelope complies with the code by +0% or greater.

#### Section 4: Compliance Statement

The proposed envelope design represented in this document is consistent with the building plans, specifications and other calculations submitted with this permit application. The proposed envelope system has been designed to meet the 2000 IECC, Chapter 8, requirements in COMcheck-EZ Version 2.5 Release 1 and to comply with the mandatory requirements in the Requirements Checklist.

Principal Envelope Designer-Name

Signature

Date

Permit Number

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## Lighting Compliance Certificate 2000 IECC

COMcheck-EZ Software Version 2.5 Release 1

Data filename: C:\Program Files\Check\COMcheck-EZ\25r1\example.cck

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10, Any Street., Bozeman, MT  
Designer/Contractor: Eric Makela  
P.O.Box 123, Bozeman, MT  
Document Author: Eric Makela  
P.O.Box 123, Bozeman, MT  
Notes: This example data file demonstrates  
compliance to 2000 IECC

**Step One:** Verify that the project information matches the information on the building plans. The city, state, code year and construction type will impact energy code compliance.

### Section 2: General Information

Building Use Description by:  
Project Type: Activity Type  
New Construction

**Step Two:** Verify that the Building End Use Method of Compliance is consistent with the project. Single occupancy buildings should always use the Whole Building Method unless each Activity Type within the building is identified separately.

#### Activity Type(s)

Office  
Convention, Conference or Meeting Center  
Corridor, Restroom, Support Area  
Storage, Industrial and Commercial  
Industrial Work, < 20 ft Ceiling Height  
Lobby - Other

#### Floor Area

4520  
420  
1400  
2520  
2700  
600

### Section 3: Requirements Checklist

Bldg.	
Dept.	
Use	
[ ]	<b>Interior Lighting</b>
	1. Total actual watts must be less than or equal to total allowed watts
	Allowed Watts Actual Watts Complies(Y/N)
	17320 12478 YES
[ ]	<b>Exterior Lighting</b>
	2. Efficacy greater than 45 lumens/W
	Exceptions:
	Specialized lighting highlighting features of historic buildings; signage;
	safety or security lighting;
	low-voltage landscape lighting.
[ ]	<b>Controls, Switching, and Wiring</b>
	3. Independent controls for each space (switch/occupancy sensor).
	Exception: Areas that must be continuously lighted.
[ ]	4. Master switch at entry to hotel/motel guest room.
[ ]	5. Two switches or dimmer in each space to provide uniform light reduction capability.
	Exceptions:
	Only one luminaire in space; An occupant-sensing device controls the area;
	The area is a corridor, storage, restroom, or lobby; Areas that must be
	continuously lighted;
[ ]	6. Photocell/astronomical time switch on exterior lights.
	Exceptions: Areas requiring lighting during daylight hours
[ ]	7. Tandem wired one-lamp and three-lamp ballasted luminaires.
	Exceptions:
	Electronic high-frequency ballasts; Luminaires not on same switch

**Step Three:** Verify that that the Actual Watts is less than the Allowed Watts and that the building Complies.

**Step Four:** Verify that that the exterior lighting called out on the lighting plans meet the 45 lumens per watt requirement. Verify that a photocell or time clock control is called out on the plans. If a time clock is identified, verify that it meets the minimum requirements in Chapter 8 of the IECC.

**Step Five:** Verify that that the switching for each interior space is shown on the lighting plans if applicable to the space. Each space with two light fixtures will have two switches unless an exception is taken. If one- or three-lamp magnetically ballasted fixtures are used verify that they will be tandem wired.

### Section 4: Compliance Statement

The proposed lighting design represented in this document is consistent with the building plans, specifications and other calculations submitted with this permit application. The proposed lighting system has been designed to meet the 2000 IECC, Chapter 8, requirements in COMcheck-EZ Version 2.5 Release 1 and to comply with the mandatory requirements in the Requirements Checklist.

Principal Lighting Designer-Name

Signature

Date

# Lighting Application Worksheet

## 2000 IECC

COMcheck-EZ Software Version 2.5 Release 1

**Step Six:** Verify that that Fixture Description shown in the documentation is consistent with that shown on the lighting plans. Verify that the Lamps per fixture and Ballast Type is consistent with the lighting plans.

**Step Seven:** Verify that the Fixture Wattage is correct. Use either the default value from COMcheck-EZ or manufacturers literature.

### Section 1: Allowed Lighting Power Calculation

A	B	C	D
Area Category	Floor Area (ft2)	Total Allowed Watts (watts/ft2)	Allowed Watts (B x C)
Office	4520	1.5	6780
Convention, Conference or Meeting Center	420	1.5	630
Corridor, Restroom, Support Area	1400	0.8	1120
Storage, Industrial and Commercial	2520	1	2520
Industrial Work, < 20 ft Ceiling Height	2700	2.1	5670
Lobby - Other	600	1	600
Total Allowed Watts =			17320

### Section 2: Actual Lighting Power Calculation

A	B	C	D	E	F
Fixture ID	Fixture Description / Lamp Description / Wattage Per Lamp / Ballast	Lamps/Fixture	# of Fixtures	Fixture Watt.	(D x E)
A	2x4 Troffer, parabolic louver / 48" T8 32W / Electronic	3	51	95	4845
B	2x4 Troffer, parabolic louver / 48" T8 32W / Electronic	3	1	95	95
C	4 ft. Wall mout, wrap-around / 48" T8 32W / Electronic	2	4	65	260
D	4 ft. Strip, surface mount / 48" T8 32W / Electronic	1	4	32	128
E	8 ft. Industrial, pendant mount / 96" T8 75W / Electronic	2	30	130	3900
F	Down light, twin tube / Twin Tube 18W / Magnetic	2	31	46	1426
G	Recessed wall washer / Incandescent 150W	1	2	150	300
H	Accent track lighting / Incandescent 50W	1	5	50	250
I	Recessed mtl halide down light / Metal Halide 50W / Magnetic	1	2	67	134
J	Low bay, pendant mount / High-Pressure Sodium 150W / Magnetic	1	6	190	1140
Total Actual Watts =					12478

### Section 3: Compliance Calculation

If the *Total Allowed Watts* minus the *Total Actual Watts* is greater than or equal to zero, the building complies.

**Lighting PASSES:** Design 28% better than code

Total Allowed Watts = 17320  
Total Actual Watts = 12478  
Project Compliance = 4842

**Step Eight:** Verify that the # of Fixtures is shown in the documentation is consistent with that shown on the lighting plans.

**Step Nine:** Verify that the Lighting complies with the code by +0% or greater.

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## Mechanical Compliance Certificate

### 2000 IECC

COMcheck-EZ Software Version 2.5 Release 1

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#### Section 1: Project Information

Project Name: COMcheck-EZ Example Building  
10, Any Street., Bozeman, MT  
Designer/Contractor: Eric Makela  
P.O.Box 123, Bozeman, MT  
Document Author: Eric Makela  
P.O.Box 123, Bozeman, MT  
Notes: This example data file demonstrates compliance to 2000 IECC

**Step One:** Verify that the project information matches the information on the building plans. The city, state and code year and will impact energy code compliance.

#### Section 2: General Information

Building Location (for weather data): Bozeman, Montana  
Climate Zone: 15  
Heating Degree Days (base 65 degrees F): 7836  
Cooling Degree Days (base 65 degrees F): 283  
Project Type: New Construction

**Step Two:** Verify that the HVAC system(s) specified in Section 3 matches what is called out on the mechanical plans and that the number of each unit type is correct. Verify that an economizer is specified if required by code.

#### Section 3: Mechanical Systems List

Quantity	System Type & Description
2	RT-2 & RT-3 - Pkg. gas/elec.: Heating: Central Furnace, Gas / Cooling: Field-Assembled DX System, Capacity >=90 - <135 kBtu/h, Air-Cooled Condenser / Single Zone
1	CU-1 - Condensing unit: Cooling: Field-Assembled DX System, Capacity >=90 - <135 kBtu/h, Air-Cooled Condenser / Single Zone
1	UH-1 - Gas unit heater: Heating: Unit Heater, Gas
1	F-1 - Gas furnace: Heating: Central Furnace, Gas / Single Zone

#### Section 4: Requirements Checklist

Bldg.	
Dept.	
Use	
[ ]	<b>Requirements Specific To: RT-2 &amp; RT-3 - Pkg. gas/elec.</b>
[ ]	1. Newly purchased heating equipment meets the heating efficiency requirements
[ ]	2. Specified equipment consists of field-assembled components - efficiency documentation provided
[ ]	3. <u>Integrated air economizer is included</u>
[ ]	<b>Requirements Specific To: CU-1 - Condensing unit</b>
[ ]	1. Specified equipment consists of field-assembled components - efficiency documentation provided
[ ]	2. Integrated air economizer is included
[ ]	<b>Requirements Specific To: UH-1 - Gas unit heater</b>
[ ]	1. Equipment minimum efficiency: Unit Heater (Gas): 78% Et @ Maximum Capacity, 74% Et @ Minimum Capacity
[ ]	<b>Requirements Specific To: F-1 - Gas furnace</b>
[ ]	1. Newly purchased heating equipment meets the heating efficiency requirements
[ ]	<b>Generic Requirements: Must be met by all systems to which the requirement is applicable</b>
[ ]	1. Load calculations per 1997 ASHRAE Fundamentals
[ ]	2. Plant equipment and system capacity no greater than needed to meet loads - Exception: Standby equipment automatically off when primary system is operating - <u>Exception: Multiple units controlled to sequence operation as a function of load</u>
[ ]	3. Minimum one temperature control device per system
[ ]	4. Minimum one humidity control device per installed humidification/dehumidification system
[ ]	5. Thermostatic controls has 5 deg. F deadband - Exception: Thermostats requiring manual changeover between heating and cooling
[ ]	6. Automatic Controls: Setback to 55 deg. F (heat) and 85 deg. F (cool); 7-day clock, 2-hour occupant override, 10-hour backup - Exception: Continuously operating zones - Exception: 2 kW demand or less, submit calculations
[ ]	7. Automatic shut-off dampers on exhaust systems and supply systems with airflow >3,000 cfm
[ ]	8. Outside-air source for ventilation; system capable of reducing OSA to required minimum

**Step Three:** Verify that the HVAC load calculations have been calculated correctly. Verify the outdoor design temperatures are correct, that the building envelope and lighting matches the compliance documentation. Verify that the HVAC systems are sized correctly.

**Step Four:** Verify that shut-off dampers are called out for all applicable exhaust and supply systems.

- [ ] | 9. R-5 supply and return air duct insulation in unconditioned spaces  
R-8 supply and return air duct insulation outside the building  
R-8 insulation between ducts and the building exterior when ducts are part of a building assembly  
- Exception: Ducts located within equipment  
- Exception: Ducts with interior and exterior temperature difference not exceeding 15 deg. F.

**Step Five:** Verify that the duct insulation R-values are called out on the mechanical plans.

- [ ] | 10. Ducts sealed - longitudinal seams on rigid ducts; transverse seams on all ducts;  
UL 181A or 181B tapes and mastics
- [ ] | 11. Mechanical fasteners and sealants used to connect ducts and air distribution equipment
- [ ] | 12. Hot water pipe insulation: 1 in. for pipes  $\leq 1.5$  in. and 2 in. for pipes  $> 1.5$  in.  
Chilled water/refrigerant/brine pipe insulation: 1 in. for pipes  $\leq 1.5$  in. and 1.5 in. for pipes  $> 1.5$  in.  
Steam pipe insulation: 1.5 in. for pipes  $\leq 1.5$  in. and 3 in. for pipes  $> 1.5$  in.  
- Exception: Piping within HVAC equipment  
- Exception: Fluid temperatures between 55 and 105 deg. F  
- Exception: Fluid not heated or cooled  
- Exception: Runouts  $< 4$  ft in length
- [ ] | 13. Operation and maintenance manual provided to building owner
- [ ] | 14. Balancing devices provided in accordance with IMC 603.15

**Step Six:** Verify that the approved duct sealing methods are specified on the mechanical plans and in all construction details showing duct sealing.

### Section 5: Compliance Statement

The proposed mechanical design represented in this document is consistent with the building plans, specifications and other calculations submitted with this permit application. The proposed mechanical systems have been designed to meet the 2000 IECC, Chapter 8, requirements in COMcheck-EZ Version 2.5 Release 1 and to comply with the mandatory requirements in the Requirements Checklist.

Principal Mechanical Designer-Name

Signature

Date

## Mechanical Requirements Description

### 2000 IECC

COMcheck-EZ Software Version 2.5 Release 1

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The following list provides more detailed description of the requirements in Section 4 of the Mechanical Compliance Certificate.

#### Requirements Specific To: RT-2 & RT-3 - Pkg. gas/elec.

1. The specified heating equipment is covered by Federal minimum efficiency requirements. New equipment of this type can be assumed to meet or exceed ASHRAE 90.1 Code requirements for equipment efficiency.
2. The specified cooling system consists of field-assembled components. Documentation must be submitted showing the system meets ASHRAE 90.1 Code equipment efficiency requirements for a comparable package equipment type and capacity range.
3. An integrated air economizer is required for individual cooling systems over 90 kBtu/h or 3,000 cfm in the selected climate. An integrated economizer allows simultaneous operation of outdoor-air and mechanical cooling.

#### Requirements Specific To: CU-1 - Condensing unit

1. The specified cooling system consists of field-assembled components. Documentation must be submitted showing the system meets ASHRAE 90.1 Code equipment efficiency requirements for a comparable package equipment type and capacity range.
2. An integrated air economizer is required for individual cooling systems over 90 kBtu/h or 3,000 cfm in the selected climate. An integrated economizer allows simultaneous operation of outdoor-air and mechanical cooling.

#### Requirements Specific To: UH-1 - Gas unit heater

1. The specified heating and/or cooling equipment is covered by the ASHRAE 90.1 Code and must meet the following minimum efficiency: Unit Heater (Gas): 78% Et @ Maximum Capacity, 74% Et @ Minimum Capacity

#### Requirements Specific To: F-1 - Gas furnace

1. The specified heating equipment is covered by Federal minimum efficiency requirements. New equipment of this type can be assumed to meet or exceed ASHRAE 90.1 Code requirements for equipment efficiency.

#### Generic Requirements: Must be met by all systems to which the requirement is applicable

1. Design heating and cooling loads for the building must be determined using procedures equivalent to those in Chapters 27 and 28 of the ASHRAE Handbook of Fundamentals or an approved equivalent calculation procedure.
2. All equipment and systems must be sized to be no greater than needed to meet calculated loads. A single piece of equipment providing both heating and cooling must satisfy this provision for one function with the capacity for the other function as small as possible, within available equipment options.
  - Exception: The equipment and/or system capacity may be greater than calculated loads for standby purposes. Standby equipment must be automatically controlled to be off when the primary equipment and/or system is operating.
  - Exception: Multiple units of the same equipment type whose combined capacities exceed the calculated load are allowed if they are provided with controls to sequence operation of the units as the load increases or decreases.
3. Each heating or cooling system serving a single zone must have its own temperature control device.
4. Each humidification system must have its own humidity control device.
5. Thermostats controlling both heating and cooling must be capable of maintaining a 5 degree F deadband (a range of temperature where no heating or cooling is provided).
  - Exception: Deadband capability is not required if the thermostat does not have automatic changeover capability between heating and cooling.
6. The system or zone control must be a programmable thermostat or other automatic control meeting the following criteria:a) capable of setting back temperature to 55 degree F during heating and setting up to 85 degree F during coolingb) capable of automatically setting back or shutting down systems during unoccupied hours using 7 different day schedulesc) have an accessible 2-hour occupant override) have a battery back-up capable of maintaining programmed settings for at least 10 hours without power.
  - Exception: A setback or shutoff control is not required on thermostats that control systems serving areas that operate continuously.
  - Exception: A setback or shutoff control is not required on systems with total energy demand of 2 kW (6,826 Btu/h) or less.
7. Outdoor-air supply systems with design airflow rates >3,000 cfm of outdoor air and all exhaust systems must have dampers that are automatically closed while the equipment is not operating.
8. The system must supply outside ventilation air as required by Chapter 4 of the International Mechanical Code. If the ventilation system is designed to supply outdoor-air quantities exceeding minimum required levels, the system must be capable of reducing outdoor-air flow to the minimum required levels.
9. Air ducts must be insulated to the following levels:a) Supply and return air ducts for conditioned air located in unconditioned spaces (spaces neither heated nor cooled) must be insulated with a minimum of R-5. Unconditioned spaces include attics, crawl spaces, unheated basements, and unheated garages.b) Supply and return air ducts and plenums must be insulated to a minimum of R-8 when located outside the building.c) When ducts are located within exterior components (e.g., floors or roofs), minimum R-8 insulation is required only between the duct and the building exterior.
  - Exception: Duct insulation is not required on ducts located within equipment.
  - Exception: Duct insulation is not required when the design temperature difference between the interior and exterior of the duct or plenum does not exceed 15 degree F.
10. All joints, longitudinal and transverse seams, and connections in ductwork must be securely sealed using weldments; mechanical fasteners with seals, gaskets, or mastics; mesh and mastic sealing systems; or tapes. Tapes and mastics must be listed and labeled in accordance with UL 181A or UL 181B.
11. Mechanical fasteners and seals, mastics, or gaskets must be used when connecting ducts to fans and other air distribution equipment, including multiple-zone terminal units.
12. All pipes serving space-conditioning systems must be insulated as follows:
  - Hot water piping for heating systems:
    - 1 in. for pipes <= 1 1/2-in. nominal diameter
    - 2 in. for pipes > 1 1/2-in. nominal diameter.
  - Chilled water, refrigerant, and brine piping systems:
    - 1 in. insulation for pipes <= 1 1/2-in. nominal diameter
    - 1 1/2 in. insulation for pipes > 1 1/2-in. nominal diameter.
  - Steam piping:
    - 1 1/2 in. insulation for pipes <= 1 1/2-in. nominal diameter
    - 3 in. insulation for pipes > 1 1/2-in. nominal diameter.
  - Exception: Pipe insulation is not required for factory-installed piping within HVAC equipment.
  - Exception: Pipe insulation is not required for piping that conveys fluids having a design operating temperature range between 55 degrees F and 105 degrees F.
  - Exception: Pipe insulation is not required for piping that conveys fluids that have not been heated or cooled through the use of fossil fuels or electric power.

- Exception: Pipe insulation is not required for runout piping not exceeding 4 ft in length and 1 in. in diameter between the control valve and HVAC coil.
- 13. Operation and maintenance documentation must be provided to the owner that includes at least the following information:
  - a) equipment capacity (input and output) and required maintenance actions
  - b) equipment operation and maintenance manuals
  - c) HVAC system control maintenance and calibration information, including wiring diagrams, schematics, and control sequence descriptions; desired or field-determined set points must be permanently recorded on control drawings, at control devices, or, for digital control systems, in programming comments
  - d) complete narrative of how each system is intended to operate.
- 14. Each supply air outlet or diffuser and each zone terminal device (such as VAV or mixing box) must have its own balancing device. Acceptable balancing devices include adjustable dampers located within the ductwork, terminal devices, and supply air diffusers.